

ART. XII. — *Eastern Division of the Miohippus Beds, with Notes on some of the Characteristic Fossils*; by O. C. MARSH.

IN 1871, the writer explored the Miocene deposits of Oregon, especially along the valley of the John Day river, and these were again examined with more care in 1873. The strata were found to be nearly a mile in thickness, and deposited in a single lake-basin, which was subsequently named the John Day basin, from the river that now drains it.\* The upper portion of these Miocene deposits represented a distinct horizon, and was named by the writer the Miohippus beds, from one of the most characteristic genera discovered in it.† Among other ungulate mammals likewise obtained from these strata were *Diceratherium*, a new genus of the *Rhinoceros* family, and *Thinohyus*, a suilline form allied to the existing peccaries. Subsequent researches brought to light other interesting fossils in this horizon, which has since been supposed to be represented only on the Pacific coast.

The Miocene strata on the eastern slope of the Rocky mountains have long been recognized in two distinct horizons, the lower known as the Titanotherium, or Brontotherium, beds, from the huge mammals which they contain, and above these, the Oreodon beds, of which that genus is characteristic.

Various vertebrate fossils have been obtained from time to time in the eastern Miocene deposits, which were not known to occur in either of the two horizons, but only of late have the uppermost strata been recognized as distinct from the Oreodon beds on which they rest. The horizon thus indicated has been named by Wortman the Protoceras beds, from a most remarkable genus, *Protoceras*, recently found in them, and described by the writer.‡

An examination of material from this horizon, recently made by the writer, brought out the interesting fact, that the genus *Miohippus* is one of its characteristic fossils, and that the type species, *M. annectens*, Marsh, described in 1874 from the Oregon beds, is present. *Diceratherium*, *Thinohyus*, and other genera typical of the western strata, are also found in the eastern, so that it is now demonstrated that the Miohippus horizon has an eastern as well as a western division, a fact of much scientific interest. Doubtless each division will be found to contain certain forms peculiar to itself, even if all are contemporaneous, a question which future discoveries must decide.

\* This Journal, vol. ix, p. 52, January, 1875.

† *Ibid.*, vol. xiv, p. 355, November, 1877.

‡ *Ibid.*, vol. xli, p. 81, January, 1891.

The next Tertiary horizon higher up has been regarded by the writer as of Pliocene age, and named the Plihippns beds, from one of the characteristic equine genera contained in it. This horizon is a very extensive one, and has been identified by the writer at various points along the eastern side of the Rocky mountains, from Canada to the Gulf of Mexico. Essentially the same deposits were likewise found by the writer in 1871 above the Miohippns beds in Oregon. Strata of still later age, named by the writer the Equus beds, occur in the same regions, east and west, often covering the Plihippns deposits.

Among the fossils of the eastern *Miohippus* beds, the artiodactyle mammals play an important part, and a few of the more interesting of these are noticed in the present article. The *Protoceras* family is of paramount interest, and the specimens in the Yale Museum promise to add considerable to what is now known of this group. The interesting family *Agriochæridæ* also occurs in this horizon.

Another family, the *Anthracotheridæ*, is well represented, and contains some of the largest mammals of the horizon. Two of these, briefly noticed below, are now known only by fragmentary remains, some of which are characteristic. The two figures in the text show respectively a last upper molar of each of these animals. A comparison of these figures indicates that the two animals were quite distinct from each other, although about the same size, and perhaps nearly related.

*Octacodon valens*, gen. et sp. nov.

The tooth represented natural size in figure 1 below may be regarded as the type of the present genus and species. It is the last upper molar of the right side, and is in fine preservation. The slight wear of the tooth shows that the animal was adult. There are five main cusps in the crown, two on the posterior half, and three on the anterior, the antero-median cusp being the smallest. On the outer margin of the tooth are three prominent buttresses with conical summits, making in all eight prominences on the crown, which feature has suggested the generic name.

The three conical buttresses on the outer border of this tooth, all strongly developed, will serve to distinguish it from the corresponding molar of *Hyopotamus*, which in several respects it resembles. In that genus, the main cusps are much more elevated. *Heptacodon*, perhaps an allied form, has a similar buttress at the anterior angle, but none at the posterior. An upper incisor found with the present tooth, and doubtless pertaining to the same individual, has a very short, compressed crown, with a strong inner basal ridge, making the inner face deeply concave.

*Heptacodon armatus*, sp. nov.

Figure 2, below, represents natural size the last right upper molar of another large ungulate mammal, the exact affinities of which cannot now be determined. This tooth is considerably worn, showing that it belonged to an old animal. The remaining molars and part of the premolars in the same series are preserved, and with them a very large canine still in position in the jaw. All are worn, but otherwise in good preservation. The tooth figured has a crown composed of five main cusps, the antero-median being the smallest. The outer buttresses are of moderate size, and there is none at the posterior angle. The enamel of this tooth and of all the series is rugose. The true molars differ greatly in size, the first being quite small, the second intermediate, and the last equal in bulk to the two others.

The last premolar has one outer and one inner cusp. The next tooth in front is larger, and has a triangular crown, and the next is close to it. The canine is very large, dependent, and oval in section. Behind it is a long diastema.



FIGURE 1.—Last upper molar of *Octacodon valens*, Marsh; seen from below.

FIGURE 2.—The same tooth of *Heptacodon armatus*, Marsh; seen from below.

Both figures are natural size.

*Protoceras comptus*, sp. nov.

A second species of this interesting genus is indicated by a young skull from the same horizon in which the type was found. This specimen, apparently the skull of a female, is in good preservation, and, when compared with the type, differs in several essential points. The maxillary plates are not elevated along the sides of the nasal aperture, and the posterior nares extend forward to between the first true molars. The whole skull is proportionally more elongate, and the facial part especially produced.



The maxillary plates of the palate are deeply cleft in front. The anterior palatine foramina open just in front of the second premolars, and long, shallow grooves extend from them to the front of the palate. The nasals are deeply furrowed behind by grooves leading backward to the supra-orbital foramina. The parietal ridges show a rugosity at the points where the horn-cores would later have appeared. The entire length of the skull is about eight inches, and from the front to the end of the molar series is five inches.

*Calops cristatus*, gen. et sp. nov.

The present type specimen is a skull in fair preservation, indicating a fully adult animal, which when alive was about half as large as a goat. In its general form and in most of its characters, this skull agrees so closely with the type of *Protoceras* as to suggest at once some affinity between the two. The dentition preserved in the premolar and molar series is essentially the same. The high maxillary plates joining the short, pointed nasals; the deep lacrymal fossa; and the posterior orbit strongly closed behind, all suggest an ally of *Protoceras*, but the parietal ridges are here elevated into distinct crests, and are without horns.

This skull when complete was about six inches in length. The distance from the front of the nasals to the junction of the parietal crests is about four inches and a half. The space occupied by the last three premolars and the true molars is about two and one-half inches.

*Thinohyus robustus*, sp. nov.

A new species of this genus is indicated by a nearly perfect skull, which shows many features of interest. It indicates an animal much larger than the type from Oregon, and one slightly superior in size to the existing collared peccary. In many respects, it resembles the latter so much, that it may be considered one of its direct ancestors.

The present species has the full complement of teeth, forty-four, but the skull has shortened, so that the first upper premolar has been crowded inside the canine. The teeth are proportionately larger than in *Dicotyles*. The last upper molar is smaller than the first or second. The last premolar has two outer cones, and one inside. The space occupied by the three upper molars is one and three-fourths inches, and the extent of the entire dental series is five inches. The whole skull is about nine inches in length.

Yale University Museum, New Haven, Conn., June 22, 1894.